REMARKS

Reconsideration of the above-identified application in view of the remarks and amendments following is respectfully requested. Claims 1-27, 39-45 are in this case. Claims 46-56 have now been added.

35 U.S.C. § 102 Rejections – Matsuzaki

The Examiner has rejected claim 1 over USC 102(e) as being anticipated by Matsuzaki et al (US Patent No. 6,283,763).

As agreed in the Interview with the Examiner of October 23, 2003, the Examiner has removed the rejection of the present application over Matsuzaki (US 6,283,763) under 102(e) as not being applicable.

35 U.S.C. § 103(a) Rejections – Matsuzaki in view of Gillio

The Examiner rejected claims 2-5, 11-17, 21, 23-25, 27, 39 and 44 over USC 103(a) as being anticipated by Matsuzaki in view of Gillio (US patent No. 5,882,206).

As agreed with the Examiner, 103(a) rejections over Matsuzaki are withdrawn as not being applicable. Below is detailed Applicant's response as discussed with the Examiner.

The object of Gillio is to provide a virtual surgery system simulator or virtual testing system simulator based on image data.

The Examiner has stated that Gillio teaches three-dimensional models as being known in the background art, specifically at column 1, lines 39-41.

However, as discussed with the Examiner, the three-dimensional models described therein are volumetric models, and are therefore quite different from the model of the present invention, which comprises a plurality of segments in a linear sequence. The model of the present invention uses a spline, as a two-dimensional function, to which other two-dimensional constructs are added, such that the combination forms an approximation of the desired three-dimensional space. In a preferred embodiment of the present invention, two-dimensional polygons are wrapped around the two dimensional spline, and are connected to it in order to create a two dimensional approximation of the three dimensional space of the organ, but an

actual three-dimensional space is never formed. Therefore, the present invention provides realistic simulated images for learning purposes, but does not seek to simulate the organ in order to provide a working model of an entire organ.

By contrast, Gillio requires that the organ be simulated as a full working model, for the purposes of surgery. This is clear as Gillio states in the abstract that the taught invention may also be used a remote or telesurgery device for performing actual surgeries through remote means.

Hence, it is clear that the invention of Gillio is directed at a different purpose of the present invention, and uses a different technique for modeling.

<u>35 U.S.C. § 103(a) Rejections – Matsuzaki in view of Gillio in further view of Asano</u>

The Examiner rejected claims 6-10, 40 and 45 over USC 103(a) as being anticipated by Matsuzaki in view of Gillio in further view of Asano (US patent no. 5,956,040).

As agreed with the Examiner, 103(a) rejections over Matsuzaki are withdrawn as not being applicable. Applicant's response as discussed with the Examiner is detailed below.

The object of Gillio is detailed above.

The object of Asano is a basic graphic algorithm for graphic rendering.

The section quoted by the Examiner, col 4 lines 21-41, describes the use of an algorithm which manipulates arrays of linked objects in response to local "pulling" or "pushing" of neighboring objects.

As discussed with the Examiner, Asano does not teach or describe the use of such an algorithm for modeling an organ, as the teachings of Asano are restricted to graphic rendering. Also, Asano teaches a different type of model, which is not related to splines.

Therefore, as discussed with the Examiner, the teachings of Asano, and Gillio are distinct from the teachings of the present invention, as Asano does not teach modeling of an organ, and Gillio does not teach the use of splines, specifically connected to polygons, but rather the use of volumetric modeling.

"Interactively Deformable Models for Surgery Simulation" discussed with Examiner in interview of October 23, 2003

As mentioned above, the present invention is directed at providing a model of an organ according to a plurality of polygons constructed according to a spline.

Reference is now made to the cover reference "Interactively deformable models for surgery simulation". The object of this reference is to provide organ modeling which will be accurate when modeling deformations of the tissue, and that would be interactive. This is done by using the concept of an active surface, which is an energy minimizing spline extended into an energy minimizing surface in a 3D space. The basic hypothesis is that the active surface will seek energy minima, and therefore deformations to the surface are unstable.

The recited reference teaches the extending of a spline into a three dimensional surface, which will be used to create a model of an organ. There is no approximation of the three dimensional space of the organ, but rather an exact calculation of it. Quoting from the aforementioned reference, "Since active contours act only in a 2D space, we must extend the concept to three dimensions. The concept of active surfaces is an energy minimizing approach to this task. In this approach, <u>we extend the energy minimizing spline into an energy minimizing 3D space"</u>. The three-dimensional surface formed is used for the creation of the organ model.

By contrast, the present invention is directed at using a spline as a two-dimensional function, to which other two-dimensional constructs are added, such that the combination forms an approximation of the desired three-dimensional space. In a preferred embodiment of the present invention, two-dimensional polygons are wrapped around the two dimensional spline, and are connected to it in order to create a two dimensional approximation of the three dimensional space of the organ. The present invention is distinct from the above reference in the fact that a three dimensional space is never formed. Instead, several two-dimensional plains are connected together in order to form a two dimensional approximation of the modeled three-dimensional space. This approach is computationally much less expensive, and can be carried out in reasonable time, as opposed to the method shown by the reference.

Additionally, the present invention uses the spline not only to form a two dimensional approximation of the three dimensional space, but also to simulate the

movement and resultant shape of the endoscope within the three dimensional space, for example when creating a loop. The simulation of the shape of a loop in the endoscope is achieved by remodeling the spline for modeling the organ, after calculation of the differential between the length of the cable fed into the organ, and the length of the organ from the endoscope entry point to the current positioning of the endoscope. History of the endoscope movement within the organ is also included for correct simulation of the loop using the spline.

Moreover, as the endoscope moves between segments of the organ, the model of the spline is recalculated and if necessary altered locally, as the movement may cause deformations affecting the spline itself.

An attached affidavit describes the mathematical basis for the present invention. It also clearly describes that the present invention uses the two-dimensional spline for an approximation of a three-dimensional model, and not to directly form a three-dimensional spline object.

It is therefore clear that the teachings of the present invention are distinct from the aforementioned reference, and the reference should not be used as prior art against Applicant.

In view of the above remarks and amendments it is respectfully submitted that claims 1-56 are now in condition for allowance. Prompt notice of allowance is respectfully and earnestly solicited.

Respectfully submitted,

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Date: December 15, 2003